

What is claimed is:

1. An apparatus for transmitting information in a seismic data acquisition system,
the apparatus comprising:
 - 5 a) a transducer for providing digital optical data signals by acting on an optical carrier; and
 - b) an optical interrogator coupled to the optical carrier for retrieving the digital optical data signals from the optical carrier.
- 10 2. The apparatus of claim 1 further comprising an optical source for providing the optical carrier to the transducer.
3. The apparatus of claim 1, wherein the transducer receives a digital electrical signal input.
- 15 4. The apparatus of claim 1, wherein the transducer modulates a property of the optical carrier.
5. The apparatus of claim 4, wherein the digital optical data signals include symbol data indicative of the modulated properties of the modulated optical carrier.
- 20 6. The apparatus of claim 4, wherein the modulated property includes one or more of amplitude and polarization.
- 25 7. The apparatus of claim 1, wherein the transducer includes a mirror for reflecting at least a portion of the optical carrier.
8. The apparatus of claim 7, wherein the mirror comprises a micro-machined mirror.
- 30 9. The apparatus of claim 4, wherein the transducer further comprises a plurality of transducers.

10. The apparatus of claim 9, wherein the plurality of transducers comprise one or more of a Bragg grating and a liquid crystal device.
- 5 11. The apparatus of claim 1, wherein the transducer receives a signal from one or more sensors.
12. The apparatus of claim 1, further comprising a power source charging circuit that receives optical power from a telemetry cable and converts the optical power to electrical
10 power.
13. The apparatus of claim 11, wherein the one or more sensors operate in a low power state.
- 15 14. The apparatus of claim 11 wherein the one or more sensors comprise one or more of i) an accelerometer; ii) a velocity sensor; iii) a hydrophone; iv) an electromagnetic sensor; v) a velocimeter; vi) a temperature sensor; vii) a heading sensor; viii) a flow sensor; and iix) an inertial sensor.
- 20 15. The apparatus of claim 3, wherein the transducer further comprises an interface circuit including an electrical-to-optical digital signal transducer.
16. A method of transmitting information in a seismic data acquisition system, the method comprising:
- 25 a) providing digital optical data signals on an optical carrier using a transducer to act on the optical carrier, and
b) retrieving the digital optical data signals from the optical carrier using an optical interrogator.
- 30 17. The method of claim 16 further comprising providing the optical carrier to the transducer using an optical source.

18. The method of claim 16 further comprising providing a digital electrical signal input to the transducer.

5 19. The method of claim 16, wherein providing digital optical data signals on the optical carrier comprises modulating a property of the optical carrier.

20. The method of claim 19, wherein the digital optical data signals include symbol data indicative of the modulated property.

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21. The method of claim 19, wherein the modulated property includes one or more of amplitude and polarization.

22. The method of claim 16, wherein providing digital optical data signals on the
15 optical carrier comprises reflecting the optical carrier using a mirror.

23. The method of claim 22, wherein the mirror comprises a micro-machined mirror.

24. The method of claim 16, wherein the transducer further comprises a plurality of
20 transducer for modulating one or more properties of the optical carrier.

25. The method of claim 24, wherein the plurality of transducers include one or more of a Bragg grating and a liquid crystal device.

25 26. The method of claim 16, wherein the transducer receives a signal from one or more sensors.

27. The method of claim 16, further comprising receiving optical power from a telemetry cable at a power source charging circuit and converting the received optical
30 power to electrical power.

28. The method of claim 26, wherein the sensors operate in a low power state.

29. The method of claim 26 wherein the one or more sensors comprise one or more of
i) an accelerometer; ii) a velocity sensor; iii) a hydrophone; iv) an electromagnetic
5 sensor; v) a velocimeter; vi) a temperature sensor; vii) a heading sensor; viii) a flow
sensor; and iix) an inertial sensor.

30. The method of claim 18 further comprising providing an interface circuit
including an electrical-to-optical digital signal transducer.

10 31. An apparatus for acquiring seismic information comprising:

- a) a sensor for sensing an environmental condition, the sensor providing a first
signal indicative of the sensed environmental condition;
- b) a transducer coupled to the sensor for receiving the first signal; and
- 15 c) an optical fiber coupled to the transducer, the transducer converting the received
first signal to a digital optical signal in the optical fiber.

32. The apparatus of claim 31, wherein the transducer modulates an optical carrier to
convert the first signal to the digital optical signal.

20 33. The apparatus of claim 31, wherein the transducer includes a controllable reflector
operable to modulate an optical carrier to convert the first signal to the digital optical
signal.

25 34. The apparatus of claim 31, wherein the transducer includes a micromachined
reflector operable to modulate an optical carrier to convert the first signal to the digital
optical signal.

30 35. The apparatus of claim 31, wherein the transducer includes an electromechanical
actuator acting on the optic fiber to modulate an optical carrier in the fiber to convert the
first signal to the digital optical signal.

36. The apparatus of claim 31, wherein the transducer includes a controllable light source, the transducer activating and deactivating the controllable light source in response to the first signal to convert the first signal to the digital optical signal.

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37. The apparatus of claim 31, wherein the sensor further includes an analog-to-digital converter, the first signal being a digital electrical signal.

38. A system for acquiring seismic information comprising:

- 10 a) a sensor for sensing an environmental condition and providing a first signal indicative of the sensed environmental condition;
- b) a transducer coupled to the sensor for receiving the first signal;
- c) an optical fiber coupled to the transducer, the transducer converting the received first signal to a digital optical signal in the optical fiber; and
- 15 d) a recorder recording information based at least in part on the digital optical signal, the recorded information being indicative of the sensed environmental condition.

39. The system of claim 38 further comprising a light source providing an optical carrier, the transducer operating on the optical carrier to convert the first signal to the digital optical signal.

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40. A method of acquiring information relating to an environmental condition, the method comprising:

- a) sensing the environmental condition with a sensor;
- 25 b) generating a first signal indicative of the sensed environmental condition;
- c) converting the first signal to a digital optical signal in an optic fiber; and
- d) transmitting the digital optical signal in the optic fiber.

41. The method of claim 40, wherein converting the first signal to the digital optical signal comprises activating and deactivating a light source.

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42. The method of claim 41, wherein converting the first signal to the digital optical signal comprises acting on an optical carrier to generate the digital optical signal.